What is claimed is:

1.   An image processing apparatus for generating
2 new image data having pixel values having all color
3 information for each interpolation point set on a
4 two-dimensional plane, from original image data made up
5 of many pixels which are arrayed in a matrix on the
6 two-dimensional plane and each of which has only a pixel
7 value representing a predetermined color information
8 level obtained by an image sensor having individual
9 color filters, comprising:
10   a replacement unit for, for a pixel value of a
11 pixel that need not be replaced by another pixel value
12 among pixel values contained in the original image data,
13 adding replacement information representing
14 non-replacement of the pixel value to the pixel value,
15 and outputting the pixel value as replacement
16 information-added image data, and for a pixel value of a
17 pixel that needs to be replaced by another pixel value,
18 replacing the pixel value by a predetermined pixel value,
19 adding replacement information indicating replacement of
20 the pixel value to the replaced pixel value, and
21 outputting the pixel value as replacement
22 information-added image data; and
23   an interpolation unit for outputting
24 interpolated pixel values having all color information
25 by interpolating a pixel value at an interpolation point

26   for each color information on the basis of a

27   predetermined arithmetic expression from pixel values of

28   pixels of the same color falling within a predetermined

29   interpolation region containing the interpolation point

30   among all replacement information-added image data

31   output from said replacement unit, and when replacement

32   information of any pixel used for calculation indicates

33   replacement, using an arithmetic expression different

34   from the arithmetic expression.

      2.   An apparatus according to claim 1, further

2   comprising:

3   a compensation value calculation unit for

4   calculating a pixel compensation value for compensating

5   for a pixel value at the interpolation point based on a

6   predetermined arithmetic expression from pixel values of

7   a plurality of pixels which are positioned around the

8   interpolation point and fall within a compensation

9   region wider than and including the interpolation region,

10   and when replacement information of any pixel used for

11   calculation indicates replacement, calculating the pixel

12   compensation value based on an arithmetic expression

13   different from the arithmetic expression; and

14   a compensation unit for compensating for the

15   interpolated pixel value at the interpolation point

16   output from said interpolation unit for each color

17   information using the pixel compensation value at the

18   interpolation point calculated by said compensation

19   value calculation unit, and outputting the interpolated

20   pixel value as a new pixel value having all color

21   information at the interpolation point.

3.   An apparatus according to claim 1, wherein

2   said replacement unit determines whether to replace each

3   pixel value, on the basis of defect information

4   indicating presence/absence of a defect of each pixel of

5   the image sensor.

4.   An apparatus according to claim 1, wherein

2   said replacement unit replaces a pixel value using a

3   pixel value of a pixel of the same color positioned

4   neighboring the pixel.

5.   An apparatus according to claim 2, wherein

2   said compensation value calculation unit calculates a

3   pixel compensation value at an interpolation point using

4   a pixel value having color information as a

5   representative of a luminance component of original

6   image data among pixels falling within the compensation

7   region.

6.   An apparatus according to claim 1, wherein

2   when target calculation pixels used to calculate the

3   interpolated pixel value include a pixel whose

4　　replacement information indicates, an arithmetic

5　　expression is used, which has a reduced weight

6　　coefficient comparing to a normal arithmetic expression

7　　for calculating the interpolated pixel value, or has a

8　　weight coefficient of 0 for the pixel or a plurality of

9　　target calculation pixels including the pixel.

7.　　　　An apparatus according to claim 2, wherein

2　　when target calculation pixels used to calculate the

3　　pixel compensation value include a pixel whose

4　　replacement information indicates replacement, an

5　　arithmetic expression is used, which has a reduced

6　　weight coefficient comparing to a normal arithmetic

7　　expression for calculating the pixel compensation value,

8　　or has a weight coefficient of 0 for the pixel or a

9　　plurality of target calculation pixels including the

10　　pixel.

8.　　　　An apparatus according to claim 2, wherein

2　　when target calculation pixels used to calculate the

3　　pixel compensation value include a pixel whose

4　　replacement information indicates replacement, said

5　　compensation value calculation unit outputs a pixel

6　　compensation value indicating non-compensation.

9.　　　　An apparatus according to claim 1, wherein

2　　　　said apparatus further comprises a region

3   value calculation unit for sequentially receiving pixel

4   values forming the replacement information-added image

5   data output from said replacement unit in parallel with

6   each other by a predetermined number of pixel lines as

7   pixel blocks for single pixel columns to form a

8   sub-matrix from a predetermined number of pixel blocks

9   received successively, calculating logical OR of

10   replacement information and sums of pixel values of

11   pixels included in respective regions set in advance on

12   the sub-matrix as region values of the respective

13   regions, and parallel-outputting the respective region

14   values in synchronism with reception of the pixel block,

15   and

16   an interpolation unit selectively uses the

17   respective region values parallel-output from said

18   region value calculation unit to sequentially calculate,

19   for each sub-matrix, interpolated pixel values at an

20   interpolation point on a sub-matrix to be processed.

10.   An apparatus according to claim 2, wherein

2   said apparatus further comprises a region

3   value calculation unit for sequentially receiving pixel

4   values forming the replacement information-added image

5   data output from said replacement unit in parallel with

6   each other by a predetermined number of pixel lines as

7   pixel blocks for single pixel columns to form a

8   sub-matrix from a predetermined number of pixel blocks

9   received successively, calculating logical OR of

10   replacement information and sums of pixel values of

11   pixels included in respective regions set in advance on

12   the sub-matrix as region values of the respective

13   regions, and parallel-outputting the respective region

14   values in synchronism with reception of the pixel block,

15   an interpolation unit selectively uses the

16   respective region values parallel-output from said

17   region value calculation unit to sequentially calculate,

18   for each sub-matrix, interpolated pixel values at an

19   interpolation point on a sub-matrix to be processed, and

20   a compensation value calculation unit

21   selectively uses the respective region values

22   parallel-output from said region value calculation unit

23   to sequentially calculate, for each sub-matrix, a pixel

24   compensation value at the interpolation point on the

25   sub-matrix to be processed

11.   An apparatus according to claim 1, wherein

2   said apparatus further comprises a defect

3   information generation unit for using relative pixel

4   position information with respect to an immediately

5   preceding defective pixel position as information

6   indicating a defective pixel position of the image

7   sensor to determine whether each pixel forming the

8   original image data is a defective pixel, and outputting

9   a determination result as defect information to said

10   replacement unit in synchronism with the each pixel, and

11   said replacement unit determines whether to

12   replace a pixel value on the basis of the defect

13   information from said defect information generation unit

14   in accordance with whether each pixel value included in

15   the original image data corresponds to a defective pixel.